

- 3 setting means in accordance with the measured progressions  
4 of the spring forces are provided.
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REMARKS:

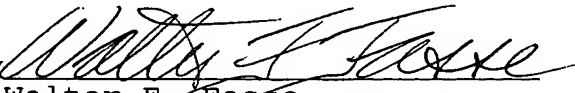
- 1) Examination of the present U. S. National Phase Application is to proceed on the basis of claims 1 to 3 and 7 to 10. Claims 8, 9 and 10 are directly based on the translated PCT International Application claims 4, 5 and 6, except for omitting multiple dependencies.
- 2) A few typographical errors (e.g. in reference numbers) that existed in the PCT International Application text and the literal English translation thereof have been corrected in the present amendment of the specification. A marked-up version of the amended pages of the specification is enclosed to show the amendatory subject matter. No new matter has been introduced. Any further informalities of the literally translated specification and claims will be addressed after receiving the first Office Action.
- 3) It is noted that the International Preliminary Examination Report indicates that at least claims 5 to 7 (i.e. present claims 9, 10 and 7) satisfy all criteria for patentability under the PCT.

- 4) Favorable consideration and allowance of claims 1 to 3 and 7 to 10 are respectfully requested.

Respectfully submitted,

Alexander VON GAISBERG et al.  
Applicant

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Encls.: postcard, marked-up  
version of Lit. Trans. pages  
5, 7, 9

By   
Walter F. Fasse  
Patent Attorney  
Reg. No.: 36132  
Tel. No.: (207) 862-4671  
Fax. No.: (207) 862-4681  
P. O. Box 726  
Hampden, ME 04444-0726

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stroke travel that is limited by the electromagnets 2, 3. A  
spring arrangement with a first spring 61 acting in the opening  
direction onto the armature 1 and a second spring 62 acting in  
the closing direction onto the armature 1 effectuates that the  
armature 1 is held in a neutral equilibrium position between the  
electromagnets 2, 3 in the de-energized condition of the exciting  
coils 20, 30. Furthermore, adjusting or setting means 71, 72 for  
setting the pre-stressing of the springs 61, 62 are provided.  
The setting means 71, 72 may, for example, be embodied as disks,  
which effectuate a compression of the springs <sup>61, 62</sup>[71, 72], and thereby  
prescribe the pre-stressing of the respective springs <sup>61, 62</sup>[71, 72].  
They may, however, also be controllably embodied, and enable a  
stepless variation of the pre-stressing.

For starting the actuator, one of the electromagnets 2, 3 is  
energized, that is to say switched on, by applying an exciting  
voltage to the corresponding exciting coil 20 or 30, or a tran-  
sient start-up oscillation routine is initiated, by means of  
which the armature 1 is first set into oscillation by alternating  
energization of the electromagnets 2, 3, in order to strike  
against the pole surface of the closing magnet 2 or the pole  
surface of the opening magnet 3 after a start-up oscillation  
transient time.

With a closed gas exchange valve 5, the armature 1 lies against  
the pole surface of the closing magnet 3 as shown in Fig. 1, and  
it is held in this position - the upper end position - as long  
as the closing magnet 3 is energized. In order to open the gas  
exchange valve 5, the closing magnet 3 is switched off, and next

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a maximum value  $F_{13}$ , which is achieved at the armature position  $I_x$ , in order to thereafter fall off to an end value  $F_{10}$  lying below the holding value  $F_{11}$ , whereby the end value  $F_{10}$  is achieved at the armature position  $I_m$ , that is to say in connection with the armature 1 lying against the opening magnet 2. In contrast, the spring force of the second spring 62 increases from an end value  $F_{20}$ , which is effective in the [in the] upper end position of the armature 1, monotonously but non-linearly to a holding value  $F_{21}$ , which is achieved in the lower end position of the armature 1. The end values  $F_{10}$ ,  $F_{20}$  give the pre-stressing of the respective spring 61 or 62; they are adjusted or set in such a manner so that the area  $A_1$  under the spring characteristic curve  $F_1$  is equal to the area  $A_2$  under the spring characteristic curve  $F_2$ . The areas  $A_1$  and  $A_2$  in that context correspond to the energy that is stored in the respective spring 61, 62, if these are compressed due to the motion of the armature. The two spring characteristic curves  $\overset{F_1, F_2}{\boxed{61, 62}}$  intersect each other at a point that prescribes the energetic center position  $I_e$  of the armature 1; this energetic center position  $I_e$ , which the armature 1 takes up with de-energized electromagnets 2, 3, generally does not correspond with the geometric center position between the electromagnets 2, 3 in connection with springs with different spring characteristic curves.

On the one hand, the substantial advantage of the first spring 61, due to the maximum value  $F_{13}$  of its spring characteristic curve  $F_1$ , is that it is in the position to store so much energy, that the armature 1 will be moved with high velocity during the de-stressing of the first spring 61, which leads to short switch-

